# Research on the Digital-Intelligence Knowledge Service Model of Vocational College Libraries for Regional Think Tank Needs

**Authors:** Feng Yueping, Tang Miaoji, Tang Miaoji

**Date:** 2024-04-08T00:00:00+00:00

## Abstract

Purpose/Significance To enrich research on new-type think tanks with Chinese characteristics, address regional think tank demands, establish an operational mechanism grounded in theoretical logic, and provide reference and guidance for the digital-intelligent transformation of university libraries.

Method/Process Employing the quadruple helix theory of knowledge production mode as the theoretical logic for the digital-intelligent transformation of university libraries oriented toward regional think tank demands, and based on the library-government-industry-enterprise quadruple helix subjects, this study explores a management approach encompassing a composite ecological chain form of service chain, policy chain, intelligence chain, and technology chain, as well as an operational process of communication and exchange—analysis and coordination—implementation and cooperation—decision adjustment, thereby proposing its operational mechanism.

Results/Conclusion Based on the investigation of think tank demands within Guangdong Province's "One Core, One Belt, One Zone" region, and following regional principles and the "database—evaluation system" cooperation process, a double-chain spiral structure operational implementation entity is constructed. Characteristic content of digital-intelligent knowledge services is excavated based on simultaneous equation stability, an intelligence monitoring indicator system is established based on the dynamic nature of simultaneous equations, and a simultaneous equation-based operational platform for university library digital-intelligent knowledge services is built oriented toward regional think tank demands, providing reference for university libraries to externally provide knowledge services.

# Full Text

## Preamble

**Title**: Theoretical Logic and Operational Mechanism of the Digital-Intelligent Transformation of University Libraries for Regional Think Tank Needs

**Authors**: Feng Yueping[1], Tang Miaoji[2]
[1](Library of Guangzhou Information Technology Vocational School, Guangzhou 510091)
[2](Library of Guangdong Construction Vocational Technology College, Qingyuan 511500)

**Biographies**: Feng Yueping, Head of Xiatangxi Campus Library, Librarian, Bachelor's degree; Tang Miaoji, Associate Research Librarian, Master's degree, 23692671@qq.com, Corresponding Author.

**Funding**: This study is one of the research outcomes of the 2020 Discipline Co-construction Project of the "13th Five-Year Plan" of Guangdong Province Philosophy and Social Science *"Research on Public Opinion Service Operation Mechanism Based on Information Ecology Perspective Under the Background of 'One Core, One Belt, One Zone' "* (Project No. GD20XTS07).

**Abstract**: [Purpose/Significance] This study enriches research on new types of think tanks with Chinese characteristics by establishing a set of operational mechanisms grounded in theoretical logic for the digital-intelligent transformation of university libraries, providing reference and guidance for this transformation. [Method/Process] The four-helix theory of knowledge production modes serves as the theoretical logic for the digital-intelligent transformation of university libraries facing regional think tank demands. Based on the four-helix entities of library, government, industry, and enterprise, this study explores management approaches encompassing a composite ecological chain of service chain, policy chain, intelligence chain, and technology chain, as well as an operational process of communication, analysis and coordination, implementation and cooperation, and decision-making adjustment, thereby proposing its operational mechanism. [Result/Conclusion] Based on research into think tank demands within Guangdong Province's "One Core, One Belt, One Zone" region, and following regional principles and a "database-evaluation system" cooperation process, a dual-chain spiral structure operational entity is constructed. By leveraging the stability of simultaneous equations, the distinctive content of digital-intelligent knowledge services is excavated; based on the dynamic nature of simultaneous equations, an intelligence monitoring index system is established. A simultaneous equation-based digital-intelligent knowledge service operation platform for university libraries is built to meet regional think tank needs, providing a reference for university libraries to conduct external knowledge services.

**Keywords**: Regional Development; Local Think Tank Construction; University Libraries; Digital-Intelligent Transformation; Knowledge Service

**Classification Number**: G258.6

## 1 Regional Think Tank Demand Analysis

Current research on the digital-intelligent transformation of libraries in China primarily focuses on undergraduate university libraries and public libraries, such as those at South China University of Technology [**?**], Northwestern Polytechnical University [**?**], Shandong University of Science and Technology [**?**], Chongqing University [**?**], Tianjin University [**?**], and Shanghai Library [**?**]. These initiatives predominantly take the form of digital-intelligent knowledge services built upon traditional library reference consultation services. In the era of big data, university library services are being propelled toward digital-intelligent transformation. Against the backdrop of China's national big data strategy, university libraries can leverage their professional staff capabilities and collection resource advantages to embed knowledge services into think tank research, capitalizing on the inherent homogeneity between knowledge services and think tank services. By fully utilizing collection data resources and applying various intelligent technologies, libraries can provide evidence-based, creative, high-level, and personalized digital-intelligent knowledge services—including decision-making consultation, intelligence analysis, and achievement transformation—to meet demand, thereby achieving integrated development of digital technology, intelligent technology, and think tank research. This transformation of university library knowledge services to meet regional think tank demands provides data assurance for regional development.

In 2022, the General Office of the Communist Party of China Central Committee issued the *National Development Plan for Philosophy and Social Sciences During the 14th Five-Year Plan Period*, which specifically emphasized the need to "strengthen the construction of new types of think tanks with Chinese characteristics" [**?**] to enhance national soft power and promote high-quality economic and social development. How to build new think tanks with "significant influence on decision-making, society, and internationally" [**?**] has become a crucial research topic under the national big data strategy. Existing think tank construction primarily relies on self-built, shared, or purchased information resource databases. However, in complex and volatile environments, this operational model cannot fully meet think tank demands, manifesting in low decision-making consultation effectiveness, insufficient endogenous practical motivation, and a lack of regional characteristic brands [**?**]. Particularly when facing regional development, local think tanks, social think tanks, and enterprise think tanks—mainly serving specific regions—encounter issues such as data fragmentation, superficial data analysis, low output, weak data collection capabilities, and insufficient cross-institutional support [**?**] during operation.

Against this backdrop, local economic development requires substantial high-quality think tank data and in-depth data analysis. Actively serving regional

think tank needs for local economic construction and industrial upgrading has become one of the service transformation directions where university libraries can leverage their information resource management advantages. This study does not explore how university libraries use digital-intelligent technologies for service transformation, but rather, grounded in serving regional think tank demands, examines the theoretical logic of university library digital-intelligent transformation based on knowledge production modes, interprets the operational mechanism of university library digital-intelligent knowledge services oriented toward regional think tank needs, and explores its operational models through practical investigation. The aim is to enrich research on new types of think tanks with Chinese characteristics and provide reference and guidance for the digital-intelligent transformation of university libraries.

### 1.1 University Management's Think Tank Needs for Talent Cultivation

The regional development policy aims to create a community of shared destiny for economic and cultural integration within the region, forming a stable development ecological chain. For example, Guangdong Province established its "One Core, One Belt, One Zone" regional development pattern in 2020, with the Pearl River Delta region as the core, the coastal economy as the development belt, and the northern ecological development area as the expansion zone. This strategically associates developed and underdeveloped areas, enabling them to coordinate, complement each other's strengths, and achieve common progress. Under the guidance of regional development policies, local universities need to invest in the "One Core, One Belt, One Zone" regional development to become the talent foundation of this ecological cycle. How to provide talent that meets enterprise needs, how to adjust talent structures to serve enterprises in the "One Core, One Belt, One Zone," and how to retain university-trained talent in these enterprises have become dilemmas facing local government and university management. University management requires substantial local think tank services to assist in decision-making and planning. Through digital-intelligent knowledge services, university libraries can analyze talent demand, talent reserves, and job positions in the "One Core, One Belt, One Zone" region.

### 1.2 Industry-Education Integration Needs at the Industry-Education Level

Currently, there exists a certain misalignment between industry talent demands and existing university talent cultivation, resulting in a large number of university graduates taking positions in sales and e-commerce—fields with low entry barriers and low professional skill requirements. The author's institution belongs to the software and information technology service industry, with professional matching rates for first employment in the past three years being 42%, 48%, and 45.3% respectively, indicating a supply-demand mismatch between school program offerings and industry talent needs. Industry education

requires continuous exploration of new application forms for university-local industry integration, real-time synchronization of program alignment, technological iteration, and skill orientation between universities and industries—all requiring high-quality data monitoring and tracking to assist intelligence analysis at the industry-education level. University libraries can provide think tank services for the industry-education level through digital-intelligent knowledge services, including domestic and international industry development directions, industry practice tracking, industry technology upgrading, industry adjustment changes, and industry evolution trends.

### 1.3 University-Enterprise Cooperation Needs at the Local Small and Medium-Sized Enterprise Level

The tactical essence of university-enterprise cooperation is to break through boundary barriers between universities and local enterprises, shaping a new community of shared destiny to achieve value innovation. Although the state has issued various university education reform plans and opinions, pushing university-enterprise cooperation toward market-oriented operations with two-way autonomous choice, large enterprises can enjoy state subsidies for university-enterprise cooperation and priority in partnering with universities. However, for the numerous small and medium-sized enterprises (SMEs) that exist in regional economic development, information asymmetry causes smooth university-enterprise cooperation. The vigorous development of SMEs represents a positive manifestation of regional economic vitality. University libraries can proactively collect information on local SMEs with university-enterprise cooperation needs based on their institution's professional characteristics, using digital and intelligent technologies to assist local SMEs in participating in university-enterprise cooperation. Subsequently, libraries can provide think tank services such as professional talent position transformation plans, enterprise product or service tracking and monitoring, and enterprise public opinion analysis. By addressing the university-enterprise cooperation think tank needs of local SMEs, university libraries can create distinctive digital-intelligent knowledge service content.

## 2 Theoretical Logic of Digital-Intelligent Transformation for Regional Think Tank Needs

The regional think tank demands for "how to cultivate talent through industry-education integration and university-enterprise cooperation" from university management, industry-education level, and local SME level provide a clear development direction for the digital-intelligent transformation of university libraries. The digital-intelligent transformation of university libraries must closely integrate library knowledge services with policy documents from local government and university management, industry-education integration, and social demands from local SMEs to ensure successful service transformation. This study employs four-helix theory to interpret the theoretical logic of university library digital-intelligent transformation.

Four-helix theory represents the third stage in the evolution of knowledge production modes. It is a "university-government-industry-civil society" four-helix knowledge production and operation system model established for multi-dimensional, networked knowledge to pursue common innovation for social benefit and ecological balance [**?**]. In the context of regional development, universities currently assisting regional development exhibit a clear management demarcation between government, industry, and civil society [**?**]. The root cause lies in the incompatibility of knowledge attributes managed by the four parties: universities manage primarily academic knowledge, government manages directive knowledge, industry manages commercial knowledge, and civil society manages social knowledge. The four-helix theoretical model links the four parties in different combinations, taking knowledge democracy as its core content to integrate hierarchical, multilateral, diverse, and heterogeneous knowledge into a new ecosystem that connects innovative talent, solutions, potential markets, and nurturing environments.

Applying four-helix theory to interpret the digital-intelligent transformation of university libraries for regional think tank needs, the four-helix entities of university, government, industry, and civil society correspond respectively to university libraries, university management, industry-education level, and local SMEs (hereinafter referred to as library-government-industry-enterprise). The unique policy authority of university management enables university library digital-intelligent knowledge services to more rapidly perceive changes in local policies. Through the industry-education level, university libraries can more conveniently enter the internal structures of local government and university management and local SMEs to form a knowledge community. Local SMEs have already participated in industry-education integration and university-enterprise cooperation to varying depths through accepting interns and introducing talent. By incorporating local SMEs as the fourth entity in the theoretical logic of university library digital-intelligent transformation, university libraries can have a solid foundation for service practice exploration when conducting digital-intelligent knowledge services for regional think tank needs, ensuring their services genuinely meet civil society demands. The entire theoretical logic framework is shown in Figure 1 [Figure 1: see original paper].

*Figure 1 Theoretical Logic of Digital-Intelligent Transformation of University Libraries for Regional Think Tank Needs*

In this theoretical logic, the primary function of university libraries is to utilize digital-intelligent technologies to serve the talent cultivation goal of "universities delivering professional talent to enterprises." University management guides the fulfillment of basic functions and work directions of each entity through orderly management, macro adjustment, and policy guidance. The industry-education level serves as a bridge between university libraries and university management and local SMEs, performing non-institutional functions such as information transmission, dialogue liaison, project implementation, cooperative development, and coordination and balance. While fulfilling their func-

tion of pursuing economic interests, local SMEs can provide internship and employment positions for university-trained talent and propose targeted talent demands to universities. For example, in serving the think tank needs of Guangdong Province's "One Core, One Belt, One Zone" region, the library of Guangzhou University, together with Guangzhou Municipal Education Bureau, the Guangdong-Hong Kong-Macao Greater Bay Area (Macau) Public Opinion and Brand Image Association, and Guangdong Conghua Economic Development Zone, formed a library-government-industry-enterprise four-helix entity. Centered on people, they established communication relationships between industry-academia-research and library-government-media in the "One Core, One Belt, One Zone" region. Using big data technology, cloud computing technology, and blockchain technology, they actively conducted digital-intelligent knowledge services for local think tank needs, assisting in the construction and development of local think tanks.

### 3.1 Management Method: Composite Ecological Chain Form

According to the theoretical logic of digital-intelligent transformation of university libraries for regional think tank needs, the four-helix entities of library-government-industry-enterprise generate a new multilateral relationship when conducting digital-intelligent knowledge services for regional think tank demands. While maintaining their own functions, they break through mutual boundaries and manage through a composite ecological chain form: (1) While providing digital-intelligent knowledge services to the industry-education level and local SMEs, university libraries can participate in the cultural governance work of local government and university management, providing strong support for the overall improvement of talent quality and the creation of a lifelong learning atmosphere in society, forming a "service chain" management method; (2) When issuing relevant policies, documents, and systems to guide each entity, local government and university management can mobilize funds and subsidies to promote specific cooperation among entities, enabling them to better integrate into the regional development pattern, forming a "policy chain" management method; (3) While performing its non-institutional functions, the industry-education level can also drive university libraries, university management, and local SMEs to share knowledge, building a knowledge production and sharing ecosystem within the region, forming an "intelligence chain" management method; (4) After strengthening the connection between professional positions and local university talent, local SMEs can expand cooperation to accept technology research achievement transformation, intelligence analysis, and topic tracking from university libraries, while seeking policy support from local government and university management regarding industry-education integration and university-enterprise cooperation. Based on communication information with the industry-education level, they can adjust innovation directions for enterprise products and services, forming a "technology chain" management method.

Under the guidance of the four-helix theoretical logic framework, the digital-intelligent transformation of university libraries can, based on library-government-industry-enterprise, form a stable fourfold helix through the composite ecological chain management methods of service chain, policy chain, intelligence chain, and technology chain. This balances resources, releases internal drive, and enhances vitality to conduct digital-intelligent knowledge services, jointly serving the think tank needs of the entire region (Figure 2 [Figure 2: see original paper]).

*Figure 2 Management Method for Digital-Intelligent Knowledge Services in University Libraries Targeting Regional Think Tank Needs*

In this management method, the university library's "service chain" management method serves as the central chain, spearheading and leading the development of digital-intelligent knowledge services. The local government and university management's "policy chain" management method serves as the direction chain, ensuring that university libraries' digital-intelligent knowledge services for regional think tank needs genuinely meet local demands. The industry-education level's "intelligence chain" management method serves as the drive chain, creating a knowledge community for university library digital-intelligent knowledge services and providing continuous intellectual drive for the entire helix ecosystem. The local SMEs' "technology chain" management method serves as the cooperation chain for digital-intelligent knowledge service practice. Without it, the development of university library digital-intelligent knowledge services would not align with the regional think tank needs of "how to cultivate talent through industry-education integration and university-enterprise cooperation."

### 3.2 Operational Process: Communication—Analysis and Coordination—Implementation and Cooperation—Decision Adjustment

The digital-intelligent knowledge services of university libraries for regional think tank needs can be interpreted as having an operational process due to their four-helix entity theoretical logic and composite ecological chain management method. When supply-demand mismatches exist between university library digital-intelligent knowledge services and the think tank needs of university management, administrative education level, and local SMEs, the four entities, guided by common goals and shared interests and based on different functional positions, use resource potential differences among the four entities as driving forces. They integrate educational and academic resources, policy directive resources, capital and social resources, and practical commercial resources possessed by the four entities. Through the composite ecological chain management methods of service chain, policy chain, intelligence chain, and technology chain, they create a mutually spiraling operational state among the four entities to promote university library digital-intelligent knowledge services for regional think tank needs (Figure 3 [Figure 3: see original paper]).

*Figure 3 Operational Process of Digital-Intelligent Knowledge Services in University Libraries Targeting Regional Think Tank Needs*

To alleviate supply-demand mismatches, smooth communication among the four entities forms the operational foundation, identifying the root causes of supply-demand mismatches and reaching preliminary cooperation intentions through communication. Next, based on directional judgments formed during communication and following local relevant policies and systems, coordination is conducted to issue clear implementation plans containing specific execution methods such as investment costs, relationship connections, and benefit outputs, as well as incentive policies and systems. Then, according to the implementation plan, the four entities cooperate by sharing costs, maintaining relationships, and sharing benefits. Subsequently, a joint decision-making system is established during implementation to ensure that the execution of the implementation plan can be continuously adjusted and optimized according to actual conditions, guaranteeing that work plans are implemented. Ultimately, through the operational process of communication—analysis and coordination—implementation and cooperation—decision adjustment, the four entities of library-government-industry-enterprise evolve in a helical manner around the chain management methods of service, policy, talent, and technology. Facing regional think tank needs, this drives supply-demand relationships toward dynamically balanced ecological development, promoting the operation of university library digital-intelligent knowledge services.

## 4 Practical Exploration of Digital-Intelligent Knowledge Services for Regional Think Tank Needs

The cooperation between university libraries and university management, industry-education level, and local SMEs represents a "four-win" non-zero-sum dynamic game among the four parties under the guidance of four-helix theoretical logic [**?**]. How to maintain and implement this non-zero-sum dynamic game cooperation process requires establishing a stable operational model. Based on practical investigation, this study proposes establishing a simultaneous equation operational model with a dual-chain spiral structure to conduct digital-intelligent knowledge services for regional think tank needs.

### 4.1 Constructing a Library-Enterprise Dual-Chain Spiral Structure Operational Entity

As analyzed previously, when university libraries conduct digital-intelligent knowledge services for regional think tank needs through the service chain, "regional service" is their service center, while the "university-enterprise cooperation" of local SMEs provides practical collaboration through the technology chain. Therefore, this study proposes constructing a "service chain + technology chain" dual-chain spiral structure operational entity of "university library + local SMEs" to lead the ecological operation of the library-

government-industry-enterprise four-helix entity and promote digital-intelligent knowledge services for regional think tank needs.

**4.1.1 Following Regional Principles** When university libraries conduct digital-intelligent knowledge services for regional think tank needs, they must prioritize following regional principles to form cooperative relationships based on shared value concepts and similar cultural backgrounds. The formation of cooperative relationships represents an act where university libraries and local SMEs break through institutional and industry barriers to integrate into each other's core management levels. Within a region, cooperation between geographically proximate parties holds comparative advantages. For example, the library of Guangdong Construction Vocational Technology College relocated from Baiyun District, Guangzhou to the Guangdong Vocational Education City in Qingyuan City in 2019. Consequently, its knowledge service cooperation partners shifted from serving enterprises in the "One Core" Guangdong Conghua Economic Development Zone to serving agricultural enterprises in the "One Belt" Qingyuan region. The library signed a technical service cooperation agreement with the local Rare Edible Fungi Research Institute, providing knowledge services related to university-enterprise cooperation position demands, enterprise certification for industry-education integration, and high-tech enterprise application declarations. Simultaneously, both parties established digital-intelligent technology cooperation around basic digital work, virtual mushroom farms, leisure agriculture metaverse experiences, and NFT mushroom digital cultural and creative products, constructing a dual-chain spiral structure cooperation method combining service chain and technology chain. Following regional principles can safeguard the long-term stability of cooperation between university libraries and local SMEs from a spatial attribute perspective.

**4.1.2 Based on the "Database—Evaluation System" Cooperation Process** In cooperation between university libraries and local SMEs, university libraries hold the initiative. Therefore, controlling the cooperation process while following regional principles is crucial. Based on research into think tank demands within Guangdong Province's "One Core, One Belt, One Zone" region, this study proposes a "database—evaluation system" cooperation process: First, according to the situation of economic development zones with concentrated enterprises in the region where the university library is located, initially construct a target cooperative enterprise database that includes enterprises that have signed industry-academia-research cooperation or university-enterprise cooperation agreements with the institution, as well as enterprises that may have future needs for industrial upgrading. This establishes a solid foundation at the starting point of the university library's digital-intelligent knowledge service process for think tank demands. Second, preliminarily screen cooperative objects for long-term digital-intelligent knowledge services around university-enterprise cooperation based on enterprise funding investment, previous cooperation history, human and intellectual resource allocation, and the number of student intern-

ship and employment positions and teacher enterprise practice opportunities they can provide. Third, establish a cooperative enterprise evaluation system to change the current situation where cooperation between university libraries and local SMEs is largely based on subjective judgments at the leadership level or by reference consultation librarians.

This study designed interview outlines for research subjects through literature analysis, deeply collecting ideas from librarians in Guangdong Province's "One Core, One Belt, One Zone" region who have conducted enterprise knowledge services regarding the selection of cooperative partners. Based on grounded theory, MATH_0 20 pieces of interview data obtained through semi-structured interviews were coded and analyzed (Table 1) and structurally explored for validation (Table 2). Ultimately, a two-level indicator evaluation system comprising three dimensions—basic cooperative partner situation, cooperation status, and cooperation matching—was proposed (Table 3 ). With a total score of 100 points equally distributed among all indicators, each of the 10 indicators is scored from 0-10 points, enabling dynamic selection of cooperative partners based on total scores. Finally, a workflow for selecting cooperative partners for university library digital-intelligent knowledge services was established, starting with building a target cooperative enterprise resource database and ending with establishing a cooperative enterprise evaluation system, enabling the dual-chain spiral structure of the operational execution entity to tend toward dynamic long-term stability.

*Table 1 Interview Data Grounded Coding Results for Cooperative Partner Evaluation System*

*(The table content shows the coding structure with primary categories A01-A03, secondary categories B01-B10, and specific items C01-C52)*

*Table 2 Interview Data Coding Structure Verification for Cooperative Partner Evaluation System*

*Note: Cronbach's Alpha > 0.8, loading > 0.6, AVE > 0.5, CR > 0.7 indicates significance*

*Table 3 Evaluation Index System for Collaborative Objects of Digital-Intelligent Knowledge Services in University Libraries*

Based on the above analysis and practice, with "regional service" as the core of the service chain for university libraries and "university-enterprise cooperation" as the content of the technology chain for local SMEs, and following regional principles and the "database—evaluation system" cooperation process, university libraries can select optimal local SMEs. Based on information resource potential differences, they can construct a library-enterprise dual-chain spiral structure operational entity that leads the ecological operation of the library-government-industry-enterprise four-helix entity and promotes digital-intelligent knowledge services for regional think tank needs.

### 4.2 Building a Simultaneous Equation Operation Platform

For university library digital-intelligent knowledge services to operate, besides having a specific operational execution entity, the platform on which they operate is also crucial for service stability. A simultaneous equation is an operational mode where multiple single-equation entities form an organic whole through certain rules. Each single equation has internal variables, can operate independently, and plays an active role in the entire simultaneous equation.

**4.2.1 Oriented by Industry-Education Integration, Excavating Distinctive Digital-Intelligent Knowledge Service Content Based on Simultaneous Equation Stability** Industry-education integration refers not only to matching local enterprise talent demands with university program offerings but also includes strategic connections between local government industrial upgrading and universities, close integration between local industrial development and university program teaching, professional adjustments to talent structure directions by local industries, and dynamic adjustments to university curriculum reforms based on changing technology demands from local enterprises. Therefore, when building a digital-intelligent knowledge service operation platform, university libraries must be oriented by industry-education integration and select knowledge service content that best fits their institution's professional characteristics as the specific direction for digital-intelligent knowledge services, based on simultaneous equation stability. Specifically, this involves assessing the fit degree between local policy documents from university management, local industry association standards from the industry-education level, and local enterprise position settings from SMEs with university programs, while simultaneously scoring the potential contribution values these three parties may generate for the university talent cultivation process (Table 4 ). Projects with high fit degrees and contribution values are selected for cooperation, excavating distinctive digital-intelligent knowledge services belonging to the library.

*Table 4 Evaluation Table for Stability of Simultaneous Equations in Digital-Intelligent Knowledge Service Operation*

*(The table shows evaluation criteria for matching degree between library resources and programs, policy relevance, industry standards, enterprise positions, etc.)*

For example, based on national strategic deployment, the Guangdong Provincial Government leads the formulation of the "One Core, One Belt, One Zone" regional development plan, construction plans, and implementation steps, then announces and implements them in project form, bringing together university management, industry-education level, and local enterprises to undertake them. University management provides funding and directional guidance for project implementation, while universities and local enterprises are responsible for project execution and implementation, with the industry-education level building a communication and coordination bridge. The author's institution has built a simultaneous equation operation platform under the guidance of

this "industry-education integration" policy chain, facing the think tank needs of the "One Core, One Belt, One Zone" region. Through simultaneous equation stability scoring, the institution's programs were assessed for fit degree and contribution value against the professional support directions in the "Building Guangdong-Hong Kong-Macao Greater Bay Area Artificial Intelligence Innovation Highland Industry Name Card" strategic plan proposed by the Guangzhou Municipal Education Bureau, the program upgrading targets of the Science and Technology Innovation Branch of Guangzhou's New Social Stratum Federation, and the talent demands of enterprises in the Pearl River Delta region, achieving a total score of 82 points. This determined cooperation around the "aerial robot" project for industry-education integration, launching distinctive digital-intelligent knowledge services focused on the artificial intelligence industry.

**4.2.2 Oriented by Innovation Intensification, Establishing an Intelligence Monitoring Index System Based on Simultaneous Equation Dynamics** In a simultaneous equation operation platform, once the local government and university management determine the general development direction, the variables within this single equation basically remain stable. The industry-education level cooperates with university management in related communication and coordination work, with relatively stable internal fluctuations in its single equation. Among these, only the local SME single equation remains in a normalized state of constant change with rapidly evolving technological development, business intelligence, and industrial trends. Oriented by innovation intensification [**?**] and focusing on the normalized changes of local SMEs, establishing an intelligence monitoring index system for local SMEs is a crucial link for the stable operation of the university library digital-intelligent knowledge service simultaneous equation operation platform.

Based on the project team's preliminary research results, this study proposes establishing an intelligence monitoring and analysis system comprising four levels: mechanism layer, model layer, application layer, and support layer [**?**]. By determining intelligence analysis objects, intelligence classification models, intelligence analysis methods, and intelligence data structure expression [**?**], an intelligence monitoring and analysis model is designed. According to the grounded coding results of interview data on the university library enterprise intelligence monitoring index system from this study's practical investigation (Table 5 ) and the interview data structure verification results (Table 6 ), an intelligence monitoring index system focusing on enterprise normalized changes is established (Table 7 ). This system monitors enterprise intelligence from eight aspects: employment process, policy documents, industry associations, teaching participation, teacher practice, material support, enterprise development, and competitors, enabling dynamic adjustment of the university library digital-intelligent knowledge service simultaneous equation operation platform oriented by innovation intensification.

*Table 5 Interview Data Grounded Coding Results for Enterprise Intelligence*

*Monitoring Index System*

*(The table shows primary categories A01-A03, secondary categories B01-B08, and specific items C01-C46)*

*Table 6 Interview Data Coding Structure Verification for Enterprise Intelligence Monitoring Index System*

*Note: Cronbach's Alpha > 0.8, loading > 0.6, AVE > 0.5, CR > 0.7 indicates significance*

*Table 7 Enterprise Intelligence Monitoring Index System for University Libraries*

Based on the above analysis and practice, with "industry-education integration" as the policy chain content and "innovation intensification" as the intelligence chain content, university libraries jointly establish a closely connected simultaneous equation operation platform with university management, industry-education level, and local SMEs as individual equations. This platform respects and balances endogenous variables generated within single-equation entities and adjusts supply-demand imbalances through directive resource potential differences.

University libraries provide evidence-based, creative, high-level, and personalized digital-intelligent knowledge services—including decision-making consultation, intelligence analysis, and achievement transformation—by leveraging their information resource management advantages and digital-intelligent technologies to conduct knowledge services for specific project tasks agreed upon to meet regional think tank needs. This represents a new opportunity for university libraries to innovate knowledge services under the national big data strategy. This study, oriented toward regional think tank needs, uses the library-government-industry-enterprise four-helix entity as the theoretical logic for university library digital-intelligent transformation. Relying on composite ecological chain management methods and through communication, analysis and coordination, implementation and cooperation, and decision adjustment, it constructs a dual-chain spiral structure simultaneous equation operational model for university library digital-intelligent knowledge services. The next step of research will refine the evaluation index system for university library digital-intelligent knowledge service cooperative partners, the simultaneous equation stability scoring table, and the enterprise intelligence monitoring index system, and explore the assignment weights of various indicators to make university library digital-intelligent knowledge services for regional think tank needs more scientific and ecological.

## References

[1] Xinhua News Agency. General Office of the Communist Party of China Central Committee Issues the *National Development Plan for Philosophy and Social Sciences During the 14th Five-Year Plan Period* [EB/OL]. (2022-04-27) [2024-02-15]. https://www.gov.cn/zhengce/2022-04/27/content_{5687532}.htm

[2] Guangming Daily. Head of National Office for Philosophy and Social Sciences Work Answers Questions on *National Development Plan for Philosophy and Social Sciences During the 14th Five-Year Plan Period* [EB/OL]. (2022-04-28) [2024-02-19]. https://www.gov.cn/zhengce/2022-04/28/content_{5687834}.htm

[3] Wen Zhiqiang, Fu Meijia, Hu Feng. Evolution Logic, Practical Dilemmas, and Future Directions of New Think Tank Construction with Chinese Characteristics [J]. *Journal of Intelligence*, 2023(2): 201-207.

[4] Wu Yawei, Gong Jiaoteng, Zhu Hongtao. Diversified Resource Integration and Service Paths for Decision-Making Consultation Research Needs of Science and Technology Think Tanks [J]. *Library and Information Service*, 2023(5): 78-89.

[5] Zhang Lei, Pan Hui. VR Reading User Interaction Behavior Empowered by Metaverse [J]. *Library Tribune*, 2023(8): 100-108.

[6] Tan Ying, Zhao Wanxin, Shi Qiaomei, et al. Research on Optimization of University Library Subject Service Model Based on DIKW Model [J]. *Journal of Academic Library and Information Science*, 2023(1): 53-57.

[7] Li Mo. Research on Smart Library Service Model and Technical Framework from the Perspective of Metaverse [J]. *Information Studies: Theory & Application*, 2022(3): 89-93, 88.

[8] Xu Tiancai, Cai Fengyu, Pan Yuting, et al. System Construction of University Library Subject Information Service Platform—Innovative Practice of Subject Services at Chongqing University Library [J]. *Library Journal*, 2023(4): 44-50, 137-139.

[9] Dong Tongqiang, Ding Shiqiang. Design of Smart Library Service Scenarios and System Driven by "Digital-Intelligent" Integration [J]. *Library Science Research*, 2022(1): 2-8.

[10] Cai Dandan, Song Gesheng, Liu Wei. Innovating Library Knowledge Services with AIGC [J/OL]. *Library Journal*. https://link.cnki.net/urlid/31.1108.G2.20231121.1855.004

[11] Xi Guiquan, Wei Chen, Fu Hong. Research on Four-Helix Collaborative Innovation Development Model for Science and Technology Service Industry [J]. *Science and Technology Management Research*, 2020(23): 31-37.

[12] Qiu Yue, Tang Miaoji. Research on Operation Mechanism of Library Public Opinion Knowledge Service Under Regional Development Strategy—Based on Information Ecology Perspective [J]. *Library Work and Study*, 2022(2): 22-29, 50.

[13] Tian Wuxu, Liu Jingwei, Pu Yongjian. Non-Cooperative Game Analysis of Regional Branding Strategy [J]. *Journal of Technical Economics & Management*, 2021(2): 45-48.

[14] Zhao Xing, Lu Qiwen. Governance of Metaverse: Prospects for Agile Governance in the Future Digital-Intelligent World [J]. *Journal of Library Science in China*, 2022(1): 52-61.

[15] Tang Miaoji, Qiu Yue. Visual Model and Scheme Design of Government Public Opinion Monitoring and Analysis for Big Data [J]. *Library and Information Guide*, 2021(1): 72-79.

[16] Shen Rongfang, Tang Miaoji. Research on Evaluation Mechanism of Library Public Opinion Information Service Ecological Chain [J]. *Library Science Research*, 2020(2): 63-69, 62.

## Author Contributions

Feng Yueping: Collected and analyzed data, wrote the paper;
Tang Miaoji: Proposed the idea, processed and analyzed data, revised the paper.

*Note: Figure translations are in progress. See original paper for figures.*